

APH Meeting on  
Needs of Blind Students in Science

Frank L. Franks

American Printing House for the Blind

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APH Meeting on  
Needs of Blind Students in Science

held in  
Atlanta, Georgia  
March 23-25, 1979

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### Participants

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Philadelphia Public Schools  
Philadelphia, Pennsylvania

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Indiana School for the Blind  
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A national meeting in science needs of blind students was held March 23-25, 1979, in Atlanta in conjunction with the National Science Teachers Association Convention. Eight expert teachers of visually handicapped students in day and residential school programs participated in the meeting. Teachers included secondary science teachers of blind students and elementary teachers of science. One graduate university student who attended public school was included to present the student point of view. One of the teachers was a blind physical science teacher.

The purpose of the meeting was to identify specific science aids and materials that are most needed by blind students in science classes and to prioritize the needs for such materials.

#### I. Mathematics Content Assessment by Experts

Participants were asked to consider science needs of visually handicapped students in terms of conceptual information and concepts as assessed by six national science content experts, after they had the opportunity of assessing the material themselves. The science content experts who assessed the material are:

Dr. Irwin Slesnick  
Professor of Biology  
West Washington University  
Bellingham, Washington 98225

Dr. Ken Ricker, Professor  
Department of Science Education  
University of Georgia  
Athens, Georgia 30602

Dr. Dean Brown, Professor  
Colorado State University  
Ft. Collins, Colorado 80521

Dr. Paul C. Beisenherz  
College of Education  
University of New Orleans  
New Orleans, Louisiana 70122

Dr. Ronald Simpson  
North Carolina State University  
Raleigh, North Carolina 27607

Dr. Jack Price, Superintendent  
Vista Unified School District  
Vista, California 92083

Content experts were asked to identify and prioritize critical items in the assessment. Focus was on information which underlies the introduction and/or comprehension of basic science concepts. The following instructions were stated in the assessment.

The American Printing House for the Blind (APH) is in the process of identifying needs in science for blind and visually handicapped (vh) students. Much information, particularly in elementary junior high science texts, is presented/introduced pictorially and is of extremely limited value to the blind and vh student. When this information underlies the introduction and/or comprehension of basic science concepts, there is a need to develop tactile aids and/or alternative procedures for presenting the conceptual information to these students.

We want you to respond to the items in this assessment to provide us with preliminary information for identifying critical concept areas in science. This information will be used by science teachers of blind and vh students in setting priorities for APH materials development projects in science. Your responses will provide a content base for the specialist teacher of blind and vh students in science to work from. The specialist teacher will:

- 1) Identify units or/concept areas where learning for the blind and vh student can be facilitated/improved with the provision of tactile aids and materials,

- 2) Prioritize these, and

- 3) Draft preliminary specifications for high priority aids and materials.

The items herein are taken from junior high science texts in an effort to pick up concepts introduced or taught from elementary through high school science. You may specify grade levels, when appropriate, if you wish.

While few blind and vh students have been enrolled in chemistry, physics, and advanced high school science courses, we do want input in these areas. For

example, no introductory set or kit of materials is available for introducing even the most elemental concepts in chemistry. If this should be designated a high priority unit, APH will consider developing such a kit or set of materials.

Also we want to anticipate new materials and emphasis in science which may appear in the science curriculum in the next 3 to 5 years in an effort to have appropriate materials available for blind and vh students when they are needed.

A copy of the assessment with priority ratings compiled is included in Appendix 1.

## II. Priority Needs Established by Teachers of Visually Handicapped

The participants met in general sessions, broke into group sessions (k-6 and 7-12), and met again in a final general session. Teachers discussed the status of mathematics instruction and relevant educational problems. Considerable time was spent in citing specific instructional problems in teaching science to blind students and with resolution of any of these problems in the classroom with individual students. In group sessions there was greater emphasis on aids and materials needs. Each group prioritized needs, and in the final session, reviewed each others priorities in setting overall materials needs. A number of recommendations were made in the final session.

Highest priorities expressed as needs include:

- 1) A need for better instrumentation and greater accuracy on existing and commercial aids (e.g., platform balance) to improve specific measurement for blind students,

- 2) A need for audio-tutorial and hands-on programs for science students at all grade levels,

3) A need for a series of kits relating to electricity and electronics which may be utilized in grades k-12,

4) A need for improved periodic charts for demonstrating the relationships which are obvious in print charts,

5) A need for science resource manuals for teachers of the visually impaired,

6) A continuing need for APH to identify and purchase commercially-available models and materials which may have utility or may be modified for use by visually handicapped students,

7) A need to continue the biological models series to include human cell types, plant and animal cells, budding, regeneration, fission, and sexual reproduction.

Specific aids which received highest priority ratings include:

1) Taping of the micro-slide lessons (for use with the slide photographs by low vision students)

2) A.C. and D.C. electrical systems,

3) Heredity charts,

4) Human body system puzzles,

5) Models of human systems,

6) Models of neurons, virus (disease carriers),

7) Model of the brain (cross-section).

A listing of these and additional aids, with preliminary specifications, are included in Appendix 2.

Priorities expressed as recommendations follow. Participants recommended that APH:

1) identify and purchase commercially-available models and materials which may have utility or may be modified for use by visually handicapped students.



2) identify and purchase instrumentation and measuring aids (e.g., digital stop watch, voltmeter, ammeter, multimeter, galvanometer, photoelectric devices) that are commercially available which can be adapted for the visually handicapped and make specific recommendations as to areas of need in instrumentations.

3) continue the biological models series to include typical human cell types, a plant and animal cell, monocot seed and stem cross section, budding, regeneration, fission, and sexual reproduction.

4) continue to develop/adapt and produce audio-tutorial programs (e.g., cell division materials in mitosis and meiosis) and to pursue this development/adaptation for students at the elementary and junior high grade levels.

5) develop a series of kits relating to electricity and electronics which may be utilized in grades k-12. Because of a general consensus of opinion between elementary and secondary grade levels, this project was given a very high priority rating.

6) conduct a survey of existing symbols in electricity, electronics, chemistry, etc., and standardize the symbols into a tactually readable format.

7) prepare improved periodic charts for demonstrating the relationships that are obvious in print charts. The group believes that available periodic charts for blind students are inadequate and fail to demonstrate relationships crucial to a true understanding of the information represented.

8) consider publishing a science resource manual for teachers of the visually imapired. The booklet should contain:

- a) Specific techniques to use in teaching science to blind students
- b) Adaptations for experiments and activities
- c) Adaptations for equipment and instruments
- d) Resources for obtaining appropriate materials and especially materials specifically designed/adapted for the v.h. child

9) Adapt and make available on quota the Micro-Slide Viewer with accompanying cards which describe each slide (National Teaching Aids, Inc., Garden City Park, New Jersey 11040). The printed materials should be recorded on cassette tapes.

APPENDIX 1

1 1. The Universe

- ☒ a. Origin of the Universe
- ☒ b. Radiant Energy
- ☒ c. Motion in the Universe
- 2 d. Stars (and/or their classification)
- ☒ e. Galaxies
- ☐ f.
- ☐ g.

The 1 categories are clearly the highest priorities designated by the content reviewers.

1 2. The Solar System

- 2 a. Origin of the Solar System
- ☒ b. Movement in the Solar System
- 2 c. Physical Properties of Heavenly Bodies
- ☒ d. The Sun
- ☒ e. The Planets
- ☐ f. Comets, Meteoroids, Meteors
- ☐ g.
- ☐ h.

A check (✓) indicates that the item received more 1's (from at least four responses) than 2's. Items averaging 1.5 and 2 (under 1 categories) are noted.

1 3. The Earth-Moon System

- ☒ a. Motions of the Earth
- 2 b. Motions of the Moon
- 2 c. Size, Shape, and Mass of the Earth
- 2 d. Size, Shape, and Mass of the Moon
- ☒ e. Surface Features
- ☐ f.
- ☐ g.

1 4. Science of the Earth



- 2 a. Origin of Earth
- ✓ b. Earth's Matter
- ✓ c. Structure of Matter
- ✓ d. Chemical Properties
- ✓ e. Physical Properties
- ✓ f. States of Matter
- \_\_\_\_\_ g.
- \_\_\_\_\_ h.

\_\_\_\_\_ 5. Minerals

- \_\_\_\_\_ a. Matter of the Lithosphere
- 2 b. Minerals
- \_\_\_\_\_ c. Mineral Identification
- \_\_\_\_\_ d.
- \_\_\_\_\_ e.

\_\_\_\_\_ 6. High Temperature and Pressure Rocks

- \_\_\_\_\_ a. The Rock Cycle
- \_\_\_\_\_ b. Origin of Igneous Rock
- \_\_\_\_\_ c. Igneous Rock Textures, Composition, and Classification
- \_\_\_\_\_ d. Origin of Metamorphic Rock
- \_\_\_\_\_ e. Metamorphic Textures, Composition, and Classification
- \_\_\_\_\_ f.
- \_\_\_\_\_ g.

\_\_\_\_\_ 7. Sedimentary Rocks

- \_\_\_\_\_ a. Origin of Sedimentary Rock
- \_\_\_\_\_ b. Weathering
- \_\_\_\_\_ c. Classification/Features of Sedimentary Rock

\_\_\_\_d.

\_\_\_\_e.

\_\_\_\_8. Erosion in Humid Regions

\_\_\_\_a. Erosion

\_\_\_\_b. Runoff

\_\_\_\_c. Mass Movements

\_\_\_\_d. River Systems in Humid Regions

\_\_\_\_e. River Deposits

\_\_\_\_f. Underground Water (movement, deposits)

\_\_\_\_g.

\_\_\_\_h.

\_\_\_\_9. Erosion in Arid Regions

\_\_\_\_a. Deposits by Water

\_\_\_\_b. Wind Erosion

\_\_\_\_c. Wind Deposits

\_\_\_\_d.

\_\_\_\_e.

\_\_\_\_10. Glaciers

\_\_\_\_a. Glacier Origin

\_\_\_\_b. Glacial Erosion

\_\_\_\_c. Glacier Deposits

\_\_\_\_d. Glacial Lakes

\_\_\_\_e. Sea Level and Glaciation

\_\_\_\_f.

\_\_\_\_g.

\_\_\_\_ 11. Topographic Maps

- \_\_\_\_ a. Map Scales
- \_\_\_\_ b. U.S. Geological Survey
- \_\_\_\_ c. Contour Lines
- \_\_\_\_ d.
- \_\_\_\_ e.

\_\_\_\_ 12. Earthquakes and the Interior of the Earth

- \_\_\_\_ a. Internal Forces
- \_\_\_\_ b. Rock Structures
- \_\_\_\_ c. Earthquakes
- \_\_\_\_ d. Seismographs
- \_\_\_\_ e. Earthquake Waves
- \_\_\_\_ f. Interior of the Earth
- \_\_\_\_ g.
- \_\_\_\_ h.

\_\_\_\_ 13. The Changing Crust

- \_\_\_\_ a. Earth's Crust
- \_\_\_\_ b. Mountains
- \_\_\_\_ c. Theories of Uplift
- \_\_\_\_ d. Continental Drift
- \_\_\_\_ e. Plate Tectonics
- \_\_\_\_ f.
- \_\_\_\_ g.

\_\_\_\_ 14. Dating Geologic Time

- \_\_\_\_ a. Measuring Earth's Age
- \_\_\_\_ b. Radioactive Clocks
- \_\_\_\_ c. Rock Clocks
- \_\_\_\_ d. Fossil Clocks

\_\_\_\_ e.

\_\_\_\_ f.

\_\_\_\_ 15. Geologic Time Scale

\_\_\_\_ a. Time Units

\_\_\_\_ b. Precambrian Time

\_\_\_\_ c. Paleozoic Era

\_\_\_\_ d. Mesozoic Era

\_\_\_\_ e. Cenozoic Era

\_\_\_\_ f.

\_\_\_\_ g.

1 16. The Atmosphere

✓ a. Atmosphere of the Earth

2 b. Composition of the Atmosphere (pressure/structure of)

✓ c. Radiant Energy

2 d. Air Circulation

\_\_\_\_ e. Major Wind Systems

\_\_\_\_ f.

\_\_\_\_ g.

1 17. Weather and Climate

✓ a. Seasons

✓ b. Climate

1.5 c. Clouds and Fog

2 d. Storms and Precipitation

2 e. Weather Forecasting

2 f. Weather Maps

\_\_\_\_ g.

\_\_\_\_ h.



\_\_\_\_ 18. The Hydrosphere

- \_\_\_\_ a. The Hydrologic Cycle
- \_\_\_\_ b. Composition of Ocean Water
- \_\_\_\_ c. Life in the Ocean
- \_\_\_\_ d. Mapping the Ocean Floor
- \_\_\_\_ e. Topography of the Ocean Floor
- \_\_\_\_ f. Deep Sea Deposits
- \_\_\_\_ g.--
- \_\_\_\_ h.

\_\_\_\_ 19. Circulation of Ocean Waters

- \_\_\_\_ a. Major Circulation Patterns
- \_\_\_\_ b. Local Currents
- \_\_\_\_ c. Tides and Waves
- \_\_\_\_ d. Erosional Processes
- \_\_\_\_ e. Shore Deposits
- \_\_\_\_ f.
- \_\_\_\_ g.

\_\_\_\_ 20. Air and Water Resources

- \_\_\_\_ a. Pollution of the Atmosphere
- \_\_\_\_ b. Pollution of Surface Water
- \_\_\_\_ c. Pollution of Underground Water
- \_\_\_\_ d. Protecting the Atmosphere and Hydrosphere
- \_\_\_\_ e.
- \_\_\_\_ f.

\_\_\_\_ 21. Natural Resources

- \_\_\_\_ a. Ores and Their Uses
- \_\_\_\_ b. Metals

- ☐ c. Nonmetals
- ☐ d. Waste Products from Mining
- ☐ e. Land as a Resource
- ☐ f. Food Resources
- ☐ g. Recycling Natural Resources
- ☐ h.
- ☐ i.

  /   22. Energy Resources

- ☒ a. Sources of Energy - Mineral Fuels
- ☒ b. Mineral Fuel Shortages
- ☒ c. Nuclear Energy
- ☒ d. Alternative Energy Sources
- ☐ e.
- ☐ f.

  /   23. Matter

- ☒ a. Classification of Matter
- ☒ b. Physical and Chemical Changes
- ☐ c. Symbols and Formulas
- ☐ d. Chemical Equations
- ☐ e. Atoms
- ☒ f. Atomic Models
- ☐ g. Periodic Tables
- ☐ h. Isotopes
- ☐ i.
- ☐ j.

  /   24. Life Science

- ☒ a. Classification
- ☐ b. Scientific Names
- ☒ c. Origins of Life
- ☐ d. Extraterrestrial Life
- ☐ e.
- ☐ f.

1 25. Evolution Theory

- ☒ a. Fossils
- ☒ b. Theory of Evolution
- ☒ c. Natural Selection
- ☐ d. Descent and Change
- ☐ e. Mutations and Theory of Evolution
- ☐ f.
- ☐ g.

1 26. Animal Organs and Systems

- ☒ a. Animal Classification
- ☒ b. Digestive System
- ☒ c. Circulatory System
- ☒ d. Spiracles, Gills, and Lungs
- ☒ e. Nervous System
- ☒ f. Endocrine System
- ☒ g. Skeleton
- ☐ h.
- ☐ i.

1 27. Animal Tissues and Cells

- 1.5 a. Kinds of Tissues
- ☒ b. Cell Theory

- ☒ c. Cell Structure
- ☐ d. RNA and Protein
- 1.5 e. DNA
- 2 f. Diffusion and Osmosis
- ☐ g. Turgor and Plasmolysis
- ☐ h. Cell Energy
- 2 i. Cell Division
- ☐ j. --
- ☐ k.

28. Behavior

- ☐ a. Behavior
- ☐ b. Tropism
- ☐ c. Reflex Act
- ☐ d. Training
- ☐ e. Instinct
- ☐ f. Chemical Senses
- ☒ g. Sense of Sound
- ☒ h. Vision
- ☐ i. Color Vision
- ☐ j. Biological Clocks
- ☐ k.
- ☐ l.

29. Plant Types and Structures

- ☐ a. Mosses and Liverworts
- ☐ b. Ferns
- ☐ c. Seed Plants
- ☐ d. Roots



- \_\_\_\_\_ e. Stems
- \_\_\_\_\_ f. Leaves
- \_\_\_\_\_ g. Plant Cells
- \_\_\_\_\_ h.
- \_\_\_\_\_ i.

  1   30. Photosynthesis

- ✓   a. Requirements for Plant Growth
- 2   b. Chlorophyll
- 2   c. Chemistry of Photosynthesis
- \_\_\_\_\_ d. Rate of Photosynthesis
- \_\_\_\_\_ e.
- \_\_\_\_\_ f.

       31. Bacteria and Viruses

- \_\_\_\_\_ a. Features of Bacteria
- \_\_\_\_\_ b. Kinds of Bacteria
- \_\_\_\_\_ c. Cultures
- \_\_\_\_\_ d. Staining
- \_\_\_\_\_ e. Nutrition
- \_\_\_\_\_ f. Filtrable Viruses
- \_\_\_\_\_ g. Structure of a Virus
- \_\_\_\_\_ h.
- \_\_\_\_\_ i.

       32. Protozoa

- \_\_\_\_\_ a. Classification of Protozoa
- \_\_\_\_\_ b. Amoebas
- \_\_\_\_\_ c. Flagellates

- d. Ciliates
- e. Sporoxoa
- f.
- g.

       33. Algae and Fungi

- a. Algae
- b. Yeasts
- c. Molds
- d. Mushrooms, Puffballs, and Bracket Fungi
- e. Lichens
- f.
- g.

  /   34. Disease

- ✓   a. Causes of Diseases
- b. Koch's Postulates
- c. Polio
- ✓   d. Vaccinations
- ✓   e. Disease Defenses
- f. Interferon
- ✓   g. Antibiotics
- 2   h. Disinfectants and Chemotherapy
- 1.5   i. Cancer
- j. Disease Carriers
- k.
- l.

  /   35. Body Structure

- ✓ a. Human Anatomy
- ✓ b. The Skeleton
- 2 c. Structure of Bones
- ✓ d. Muscles
- e.
- f.

1 36. Circulation, Respiration, and Excretion

- ✓ a. The Heart
- ✓ b. Arteries and Veins
- ✓ c. Capillaries
- ✓ d. Circulation of the Blood
- ✓ e. Blood
- 2 f. Red and White Blood Cells
- g. Lymph
- 2 h. Blood Clotting
- i. Blood Types
- ✓ j. Respiration
- ✓ k. Excretion
- l.
- m.

1 37. Control and Regulation

- ✓ a. Central and Peripheral Nervous Systems
- ✓ b. Brain and Spinal Cord
- ✓ c. Neurons and Stimuli
- 2 d. The Autonomic Nervous System
- ✓ e. The Endocrine System

\_\_\_\_ f.

\_\_\_\_ g.

1 38. Nutrition

✓ a. Nutrition

2 b. Water

1.5 c. Minerals

✓ d. Carbohydrates

1.5 e. Fats and Oils

✓ f. Proteins

✓ g. Vitamins

✓ h. Energy from Food

✓ i. Digestion

✓ j. Digestive System

1.5 k. Food Absorption

\_\_\_\_ l.

\_\_\_\_ m.

1 39. Reproduction in Animals

2 a. Budding and Regeneration

2 b. Fission

✓ c. Sexual Reproduction

\_\_\_\_ d. Frogs

✓ e. Mammals

✓ f. Human Reproduction

2 g. Gestation

\_\_\_\_ h. Embryology

\_\_\_\_ i.

\_\_\_\_ j.



1 40. Reproduction in Plants

- ✓ a. Flowers
- ✓ b. Pollination and Fertilization
- ✓ c. Seeds
- ✓ d. Germination
- 2 e. Seed Dispersal
- f.
- g.

1 41. Principles of Heredity

- ✓ a. Dominant and Recessive Traits
- 1.5 b. Hybrids
- ✓ c. Mendel's Laws
- d. Blending
- ✓ e. Gene Theory
- 2 f. Reduction Division
- 2 g. Sex Determination
- h.
- i.

     42. Heredity in Humans and Other Organisms

- a. Pedigrees
- b. Sex-Linked Traits
- c. Multiple-Gene Inheritance
- d. Mutations
- e. Heredity and Environment
- f. Animal and Plant Breeding
- g.
- h.

/ 43. Ecology

- / a. The Biosphere
- / b. Ecological Pyramid
- 1,5 c. Succession and Climax Community
- 1,5 d. Biomes
- \_\_\_\_\_ e. Tropical Rain Forest
- \_\_\_\_\_ f. Temperate Forests
- \_\_\_\_\_ g. Desert
- \_\_\_\_\_ h. Grassland
- \_\_\_\_\_ i. Tropical Savannah
- \_\_\_\_\_ j. Tundra
- \_\_\_\_\_ k. Ocean
- \_\_\_\_\_ l.
- \_\_\_\_\_ m.

## \_\_\_\_\_ 44. Conservation

- \_\_\_\_\_ a. Soil Conservation
- \_\_\_\_\_ b. Forest Conservation
- \_\_\_\_\_ c. Wildlife Conservation
- \_\_\_\_\_ d. Water Conservation
- \_\_\_\_\_ e. Water Pollution
- \_\_\_\_\_ f.
- \_\_\_\_\_ g.

/ 45. Human Ecology

- ✓ a. Population Growth
- ✓ b. Food Supply
- ✓ c. Energy
- ✓ d. Air Pollution

- ☒ e. Recycled Resources
- ☐ f. Living Space
- ☐ g.
- ☐ h.

1 46. Metrics

- 1.5 a. Experiments
- 2 b. Theories and Laws
- ☒ c. Measurements
- ☒ d. Measuring Length
- ☒ e. Measuring Mass and Weight
- ☒ f. Measuring Volume
- ☒ g. Temperature
- ☐ h. Indirect Measurement
- ☐ i.
- ☐ j.

1 47. Force and Work

- ☒ a. Force
- ☒ b. Work
- ☒ c. Machines
- 2 d. Levers
- 2 e. Pulleys
- 2 f. Wheel and Axle
- 2 g. Inclined Plane
- 2 h. Wedge
- 2 i. Screw
- 2 j. Efficiency
- 1.5 k. Power
- ☐ l.
- ☐ m.

1 48. Moving Bodies✓ a. Weight and Mass✓ b. Gravity2 c. Speed2 d. Acceleration2 e. Deceleration2 f. Vectors2 g. Velocity    h.    i.    49. Laws of Motion    a. First Law of Motion    b. Second Law of Motion    c. Third Law of Motion    d. Falling Bodies    e. Relative Motion    f. Motion in Curves    g. Momentum    h.    i.1 50. Classification of Matter✓ a. Matter✓ b. Elements✓ c. Compounds✓ d. Mixtures✓ e. Physical Properties✓ f. Chemical Properties

- ☒ g. Physical Change
- ☒ h. Chemical Change
- ☐ i.
- ☐ j.

     51. Atoms and Compounds

- ☐ a. Atomic Theory
- ☐ b. Subatomic Particles
- ☐ c. Atomic Structure
- ☐ d. Electron Location
- ☐ e. Molecules
- ☐ f. Bonding
- ☐ g. Valence
- ☐ h. Binary Compounds
- ☐ i. Polyatomic Ions
- ☐ j.
- ☐ k.

  /   52. Solids, Liquids, and Gases

- ☒ a. Phases of Matter
- ☒ b. Solids
- 2   c. Crystals
- ☐ d. Ionic Bonding in Crystals
- ☐ e. Covalent Bonding in Crystals
- ☐ f. Crystalization
- ☐ g. Amorphous Solids
- ☒ h. Liquids
- ☒ i. Gases
- ☐ j. Pascal's Law



- ✓ k. Change of Phase
- 2 l. Solid-Gas Change
- 2 m. Liquid-Solid Change
- 2 n. Liquid-Gas Change
- o.
- p.

     53. Periodic Table

- a. Atomic Mass
- b. Mendeleev's Table
- c. Moseley's Table
- d. Isotopes
- e. Average Atomic Mass
- f. Reading the Periodic Table--Columns
- g. Reading the Periodic Table--Rows
- h. Chemical Activity
- i.
- j.

     54. Families of Elements

- a. Halogen Family
- b. Oxygen Family
- c. Nitrogen Family
- d. Alkali Metals
- e. Alkaline Earth Metals
- f. Noble Gases
- g.
- h.

     55. Carbon and Its Compounds

- \_\_\_\_\_ a. Organic Chemistry
- \_\_\_\_\_ b. Structural Formulas
- \_\_\_\_\_ c. Isomers
- \_\_\_\_\_ d. Saturated Hydrocarbons
- \_\_\_\_\_ e. Unsaturated Hydrocarbons
- \_\_\_\_\_ f. Polymers
- \_\_\_\_\_ g. Other Organic Compounds
- \_\_\_\_\_ h.
- \_\_\_\_\_ i.

\_\_\_\_\_ 56. Solutions

- \_\_\_\_\_ a. Solutions
- \_\_\_\_\_ b. Formation of Solutions
- \_\_\_\_\_ c. Rate of Solution
- \_\_\_\_\_ d. Solvents
- \_\_\_\_\_ e. Polar Molecules
- \_\_\_\_\_ f. Solutions as Conductors
- \_\_\_\_\_ g. Solubility
- \_\_\_\_\_ h. Concentration
- \_\_\_\_\_ i. Saturation
- \_\_\_\_\_ j. Hydrated Crystals
- \_\_\_\_\_ k. Properties of Solutions
- \_\_\_\_\_ l.
- \_\_\_\_\_ m.

\_\_\_\_\_ 57. Chemical Reactions

- \_\_\_\_\_ a. Conservation of Mass
- \_\_\_\_\_ b. Chemical Equations
- \_\_\_\_\_ c. Double Replacement

- \_\_\_\_\_d. Single Replacement
- \_\_\_\_\_e. Decomposition
- \_\_\_\_\_f. Synthesis
- \_\_\_\_\_g. Energy and Chemical Change
- \_\_\_\_\_h. Molecular Mass and Formula Mass
- \_\_\_\_\_i. Mass and Chemical Reactions
- \_\_\_\_\_j.
- \_\_\_\_\_k.

\_\_\_\_\_58. Acids, Bases, and Salts

- \_\_\_\_\_a. Acids
- \_\_\_\_\_b. Bases
- \_\_\_\_\_c. Indicators
- \_\_\_\_\_d. Hydrogen and Hydroxide Ions
- \_\_\_\_\_e. pH of a Solution
- \_\_\_\_\_f. Salts
- \_\_\_\_\_g. Anhydrides
- \_\_\_\_\_h.
- \_\_\_\_\_i.

1 59. Heat Energy

- ✓ a. Kinetic and Potential Energy
- ✓ b. Radiation, Conduction, and Convection
- 2 c. Measuring Heat
- \_\_\_\_\_d. Joule's Experiment
- \_\_\_\_\_e. Molecular Kinetic Energy
- \_\_\_\_\_f. Melting and Vaporization
- \_\_\_\_\_g.
- \_\_\_\_\_h.

\_\_\_ 60. Heat and Its Uses

- \_\_\_ a. Specific Heat
- \_\_\_ b. Heating Systems
- \_\_\_ c. Gas Laws
- \_\_\_ d. Refrigeration
- \_\_\_ e. Heat Engines
- \_\_\_ f. Thermal Pollution
- \_\_\_ g. Cryogenics
- \_\_\_ h.
- \_\_\_ i.

\_\_\_ 61. Waves

- \_\_\_ a. Waves
- \_\_\_ b. Wave Frequency
- \_\_\_ c. Sound Waves
- \_\_\_ d. Resonance, Wavelength, and Frequency
- \_\_\_ e. Pitch
- \_\_\_ f. Volume
- \_\_\_ g. Ripple Tank
- \_\_\_ h. Reflection
- \_\_\_ i. Refraction
- \_\_\_ j. Doppler Effect
- \_\_\_ k. Electromagnetic Spectrum
- \_\_\_ l.
- \_\_\_ m.

\_\_\_ 62. Optics

- \_\_\_ a. Plane Mirrors
- \_\_\_ b. Parabolic Mirrors

- ☐ c. Index of Refraction
- ☐ d. Lenses
- ☐ e. Lenses and Vision
- ☐ f. Telescopes
- ☐ g. Prisms
- ☐ h. Wavelength and Frequency
- ☐ i. Polarization and Interference
- ☐ j. Photoelectric Effect
- ☐ k.
- ☐ l.

2 63. Electricity

- ☒ a. Electric Charges
- ☒ b. Conduction
- ☐ c. Electrostatic Induction
- ☒ d. Direct Current
- ☐ e. Diode and Thermocouple
- 2 f. Magnetism
- 1.5 g. Alternating Current
- ☐ h. Electrical Units
- ☐ i.
- ☐ j.

64. Electronics

- ☐ a. Circuits
- ☐ b. Vacuum Tubes
- ☐ c. Capacitors
- ☐ d. Rectifiers
- ☐ e. Cathode-Ray Tube

- \_\_\_\_ f. Transistors
- \_\_\_\_ g. Integrated Circuits
- \_\_\_\_ h. Computers
- \_\_\_\_ i.
- \_\_\_\_ j.

\_\_\_\_ 65. Radiation

- \_\_\_\_ a. X Rays
- \_\_\_\_ b. The Roentgen
- \_\_\_\_ c. Radioactivity
- \_\_\_\_ d. Radioactive Isotopes
- \_\_\_\_ e. Alpha, Beta, and Gamma Rays
- \_\_\_\_ f. Half-Life
- \_\_\_\_ g. Radiation Detection
- \_\_\_\_ h. Cloud Chambers and Bubble Chambers
- \_\_\_\_ i. Nuclear Emulsions
- \_\_\_\_ j. Radiation Counters
- \_\_\_\_ k.
- \_\_\_\_ l.

\_\_\_\_ 66. Nuclear Reactors

- \_\_\_\_ a. The Cyclotron
- 1.5 b. Atomic Nucleus
- \_\_\_\_ c. Transmutation
- ✓ d. Nuclear Fission
- 1.5 e. Nuclear Reactors
- ✓ f. Nuclear Fusion
- 1.5 g. Thermonuclear Power
- 1.5 h. Nuclear Energy and the Environment



APPENDIX 2

Concept  
Area

Animal Tissues and Cells

Priority Level 1Title Micro Slide ViewerBrief Description

Small, light weight, plastic microslide viewer with accompanying cards which describe each slide.

Educational Objective/Purpose

1. View slides of animal cells, tissues, systems
2. Describe each slide

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

Approximately 9" tall with a 6" x 6" base. Black, plastic. The printed materials on the cards should be recorded on cassette tapes.

Source:

National Teaching Aids, Inc.  
120 Fulton Avenue  
Garden City Park, N.Y. 11040

Known Similar Materials -- Commercially Available (With implications for adaptation)

Address on front of page

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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Concept

Area

Electricity

Priority Level 1

Title A. C. systems

Brief DescriptionEducational Objective/Purpose

Leave basic A.C. wiring.

Build a simple radio or similar device.

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

Breadboard should have raised lines to show wiring. Clips are used to eliminate soldering.

Known Similar Materials -- Commercially Available (With implications for adaptation)

Radio Kit should be available.

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS    Highest Priority

Concept  
Area    Electricity    Priority Level 1

Title    D. C. systems

Brief Description

Basic concepts dealing with D. C. systems.

Educational Objective/Purpose

Expose students to D. C. systems.  
The use of switches to open and close systems.  
How parallel and series systems differ.  
How to make a simple magnet.

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

Basic breadboard D. C. system.  
Raised lines for wires (i.e., printed circuit diagram).  
Battery should be held in place.  
Signal tone for closed circuit--louder for higher voltage (batteries in series).  
9 V batteries with snaps for poles (snaps are different sizes for + and - poles).

Have switch to break circuit and wire other materials to bridge gap to show conductivity of other materials.



Known Similar Materials -- Commercially Available (With implications for adaptation)

Radio Shack?

Standard 9 Volt batteries

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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## SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area Principles of Heredity Priority Level High

Title \_\_\_\_\_

Brief Description

Educational Objective/Purpose

To better acquaint students with genetic information by the use of models (take apart--possibly). Also charts (tactile).

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

Various models portraying genetic crosses.

- (1) Dominant and (2) Recessive Traits--Pedigree Chart.  
Family Tree type thing
- (3) Sex-Linked traits--chart
- (4) Blending (incomplete dominance)--chart
- (5) Chromosome--pairs (match chromosomes)
  - (a) extra chromosome  
Down's Syndrome type thing
  - (b)xxy, (c) xyy, (d) Translocation, (e) transmutation--  
crossing over of chromosomes.
- (6) Gene theory--codons Nitrogen bases

Mendel's Laws  
Written material  
Dominance

Hybrids

Known Similar Materials -- Commercially Available (With implications for adaptation)

Should be checked.

Suggestions for Accompanying Teacher Materials

Need to have accompanying instructional materials  
Possible (punnet square type crosses to work out)

Schematics or Diagrams (If appropriate)

Refer to front.

Different textures and shapes of model type structures could be made possibly  
to portray crosses.

All things color coded for partially sighted

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area Human Body Systems Priority Level 1

Title Human Body Systems Puzzles

## Brief Description

Tactual puzzle of each major system of the human body

## Educational Objective/Purpose

1. To enable the braille student to learn which organs belong in which system.
2. To help the student learn the location of the organs within a system and their spatial relationships.

(This is a reinforcement activity for braille students as sighted students label, color, etc. diagrams of each system to reinforce these concepts.)

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

Inlaid puzzle in which each organ has a different texture to it and if possible is labeled in braille. There should be a different puzzle for each major system of the human body: digestive, respiratory, circulatory, nervous, excretory, reproductive.

Known Similar Materials -- Commercially Available (With implications for adaptation)

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

See biology text.

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area

Human Systems

Priority Level 1

Title Models--Human systems

## Brief Description

Raised models with tactually discriminable features depicting each major system of the human body.

## Educational Objective/Purpose

1. To enable the student to observe organ locations and spatial relationships.
2. To enable the student to learn which organs belong in each system.

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

Models should be at least 30" long and 14" wide. They should be consistent with biological models in tactual stimuli and color.



Known Similar Materials -- Commercially Available (With implications for adaptation)

None known

Suggestions for Accompanying Teacher Materials

Pamphlet with diagrams and labels

Schematics or Diagrams (If appropriate)

See Biology text.

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area Elementary Science Priority Level 1

Title Booklet: Science for the Visually Impaired

## Brief Description

Resource booklet for elementary science teachers, containing techniques and suggestions for teaching science to the v.h. child

## Educational Objective/Purpose

Booklet should contain:

1. Specific teaching techniques
2. Experiment and activity adaptations
3. Instrument specifications and adaptations
4. Resources for obtaining appropriate materials and especially materials specifically designed/adapted for the v.h. child

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

1. Elicit and compile ideas and suggestions from science teachers across the nation involved with teaching the v.h. student.

Known Similar Materials -- Commercially Available (With implications for adaptation)

none--reference book: NSTA's Science for the Physically Handicapped.

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area Control and Regulation Priority Level High.

Title Neurons--Model

## Brief Description

3 types (associative, motor, receptor, synapse).

Should show relationship of the three and also structure/function of mechanisms.

## Educational Objective/Purpose

To show and demonstrate obvious differences in structure/function.

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

See BSCS yellow--chapter on coordination (chap. 13 or 14)

Would illustrate action, direction, chemicals involved, and over all coordination.

Known Similar Materials -- Commercially Available (With implications for adaptation)

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area Earth-Moon System Priority Level 2

Title \_\_\_\_\_

## Brief Description

Small model of Sun-Earth-Moon system (rotating and revolving)

## Educational Objective/Purpose

1. Observe earth revolution around sun
2. Observe moon revolution around earth
3. Show rotation of moon, earth, sun
4. Demonstrates eclyssis

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

Hubbard Materials  
"Project Planetarium"  
Earth-Moon-Sun  
Model only

The Printing House needs to make this "more durable"--it comes apart and we don't want it to. Might also make the face of the moon tactual.



Known Similar Materials -- Commercially Available (With implications for adaptation)

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept

Area Moving Bodies Priority Level 2

Title Gravity: Galileo's laws

## Brief Description

A grooved inclined plane with cork and steel balls

## Educational Objective/Purpose

To demonstrate that the weight of a body does not affect the gravitational acceleration

## Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

1 grooved (2 grooves) wooden 1" x 4" x 2' board raised 6" at one end  
1 cork ball 1" diam.  
1 steel ball 1" diam.

wall at foot of board of sounding material

balls placed at top of board  
hit foot of board with audible sound--device should be in box to avoid balls rolling

Known Similar Materials -- Commercially Available (With implications for adaptation)

Have seen something similar without sound board--but think it was teacher made

Suggestions for Accompanying Teacher Materials

Materials should be handled and manipulated by students--steel and cork balls could be weighed on APH balance (styrofoam may be substituted for cork)

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept Area Control and Regulation Priority Level 2

Title Model of a Neuron (nerve cell), bone cell, blood cell, skin (epidermis), smooth muscle, and striated muscle

## Brief Description

Raised line tactual model of a nerve cell showing various parts. (Also other cells listed)

## Educational Objective/Purpose

The student will observe the shape of a \*nerve cell and identify the various parts.

\* the various types

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

The model should be consistent in size, tactual stimuli and color code with the biological models.

Known Similar Materials -- Commercially Available (With implications for adaptation)

None

Suggestions for Accompanying Teacher Materials

Same as biological models--diagram and labels

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept Area Westher and climate Priority Level 2

Title Weather Map

## Brief Description

Magnetic tactual weather map

## Educational Objective/Purpose

1. To show a braille student what a weather map is
2. To enable a braille student to record data on a weather map

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

Magnetic tactual map of the United States on which magnetic pieces can be placed and moved around representing

1. cold fronts
2. warm fronts
3. stationary fronts
4. highs
5. lows
6. isobars

Magnetic pieces should be the proper shape and color. Map should be contrasting color such as white.

Known Similar Materials -- Commercially Available (With implications for adaptation)

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept Carbon-Hydrogen-Oxygen (Cycle)  
Area Recycling of Nitrogen (Cycle) Priority Level -

Title \_\_\_\_\_

Brief Description

Braille plastic cards--color coded for sighted/raised line for totals--  
complete with braille explanation

Understanding a cycle--better--to give a learning aid to recycling of elements.

Educational Objective/Purpose

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

Plastic sheets/cards complete with tape cassette to supplement self-instruction

Known Similar Materials -- Commercially Available (With implications for adaptation)

None

Suggestions for Accompanying Teacher Materials

Cards should be used for both sighted and v.i. students

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area Bacteria and Virus Priority Level

Title Bacteriophage

## Brief Description

The phage life cycle in cells of bacteria

## Educational Objective/Purpose

Understanding "Phage" concept

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

Plastic sheet (card), color coded, raised line  
Shows structure of bacteria and basic structure of virus.

Known Similar Materials -- Commercially Available (With implications for adaptation)

See BSCS (yellow) Harcourt Brace (Pg 470)

Suggestions for Accompanying Teacher Materials

Tape (cassette)

Schematics or Diagrams (If appropriate) --All writing also in Braille.

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area \_\_\_\_\_ Plant Types and Structure \_\_\_\_\_ Priority Level 2

Title Model of plant and animal cell

## Brief Description

Raised tactual model of a plant and animal cell (side by side)

## Educational Objective/Purpose

The student will observe the differences and likenesses of plant and animal cells.

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

The model should be consistent in size, tactual stimuli and color with the biological models.

Known Similar Materials -- Commercially Available (With implications for adaptation)

None

Suggestions for Accompanying Teacher Materials

Same as biological models--diagram and labels.

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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## SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area Human Organs and Systems Priority Level 2

Title \_\_\_\_\_

### Brief Description

1. Human (near life size) model with removeable organs and with tapes describing the function, etc. of each.

### Educational Objective/Purpose

The student will be able to identify specific organs within the human body by utilizing the life-size model and tapes pertaining to such.

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

1. Model of human body (near life size) with numbers on each organ with accompanying tape describing function, etc.
2. Model should be made of a durable material.



Known Similar Materials -- Commercially Available (With implications for adaptation)

Model available, source, unknown, may need a braille number system.

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area Reproduction in Animals Priority Level 2

Title Models: Budding/Regeneration, Fission, Sexual Reproduction

## Brief Description

Raised tactual models of above

## Educational Objective/Purpose

The student will observe budding and regeneration, fission and sexual reproduction

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

The models should be consistent in size, tactual stimuli, and color code with the biological models.

Known Similar Materials -- Commercially Available (With implications for adaptation)

Some are available--they are <sup>in</sup>adequate and probably could not be adopted

Suggestions for Accompanying Teacher Materials

Same as biological models--diagram and labels

Schematics or Diagrams (If appropriate)

See biology text

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area

Reproduction In Plants

Priority Level 2

Title Monocot Seed Model

## Brief Description

Raised tactual model of monocot seed showing various parts

## Educational Objective/Purpose

The student will observe the monocot seed and identify the parts

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

The model should be consistant in size, tactual stimuli and color code  
with the biological models.

Known Similar Materials -- Commercially Available (With implications for adaptation)

None that are acceptable

Suggestions for Accompanying Teacher Materials

Same as biological models--with diagram and labels

Schematics or Diagrams (If appropriate)

See biology book

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept Area Space Travel Priority Level 2  
Title 3-Stage Rocket

## Brief Description

3-Stage Apollo-Saturn rocket which may be taken apart showing its various parts and how they separate

## Educational Objective/Purpose

To show blind student the various parts of a multistage rocket, their location in or on the rocket, and how they separate

## Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

3-Stage Appolo-Saturn rocket made of sturdy plastic which can be taken apart to show each stage and its engines, where the service module is, where the command module is, where the lunar module is, etc.  
Model should be large enough that student can easily identify parts.

Known Similar Materials -- Commercially Available (With implications for adaptation)

Models of rockets are available, however, often they are not.

1. Sturdy enough for long term use
2. Tactual enough and they don't show the lunar module, etc. inside the rocket.

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

Resource Persons for Project Development

Persons Writing Specifications

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Concept  
Area \_\_\_\_\_ Disease \_\_\_\_\_ Priority Level High

Title Model of Virus (Disease Carriers)

Brief Description

Plastic model, showing protein sheath and genetic info. (something like pipe cleaners).

Educational Objective/Purpose

Assist in explanation of "phage" virus and bacteria.

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

Should have accompanying tape instructions, explaining step by step procedure of how "phage" injects its genetic info into bacterial cell (see page 2).

Known Similar Materials -- Commercially Available (With implications for adaptation)

Should be checked.

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

genetic info--(i.e. pipe cleaners)

protein sheath (plastic)

Resource Persons for Project Development

Persons Writing Specifications

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## SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area \_\_\_\_\_ Disease \_\_\_\_\_ Priority Level \_\_\_\_\_ High \_\_\_\_\_

Title \_\_\_\_\_ Bacterial Model (Disease Carriers) \_\_\_\_\_

Brief Description

Raised plastic molds--color coded .

Educational Objective/Purpose

Assist in explanation of "phage" and perhaps be used by itself to serve as a bacterial model. Also could be used in contrast with cell (animal/plant).

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

Known Similar Materials -- Commercially Available (With implications for adaptation)

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

(see front.) Model should show (demonstrate) similarities and differences between shapes and organelles of 3 types of bacterial cells.

Should be noted: models of each of the three (3) types are readily available-- if the teacher is inventive enough (springs, balls, oblong block of wood).

Resource Persons for Project Development

Persons Writing Specifications

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# SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS

Concept  
Area Control and regulation Priority Level High

Title Brain - Model (X-Section)

Brief Description

Educational Objective/Purpose

Physical and Functional Specifications (E.g., size, weight, texture, color,  
type of material, what it should do,  
manipulative, audio, self-instructional)

Possible vacuform models.

Overlays of different section of brain.

Cerebrum, Cerebellum, Spinal Cord, Medulla.

These could be shown separate and then together.

Color coded.

Self-instructional materials should accompany the schematics.

Known Similar Materials -- Commercially Available (With implications for adaptation)

Suggestions for Accompanying Teacher Materials

Schematics or Diagrams (If appropriate)

I-D various sections  
through raised lines.  
Color coded for low  
vision.

Resource Persons for Project Development

Persons Writing Specifications

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SCIENCE MATERIALS -- PRELIMINARY SPECIFICATIONS Highest Priority

Concept  
Area

Resource Booklet

Priority Level

Title

Brief Description

A booklet showing models and audio material available for Visually Impaired aimed toward the INSTRUCTOR.

Educational Objective/Purpose

Separate sections or even separate booklets could be made for various content areas--Biology, Chemistry, Physics

- \* It would also show--rather dramatically--what is available as opposed to what is needed. Specifically in the Chemistry/Physics area.

Physical and Functional Specifications (E.g., size, weight, texture, color, type of material, what it should do, manipulative, audio, self-instructional)

The need for better instrumentation is a must.





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